

FOUNDATION (N₂)

①

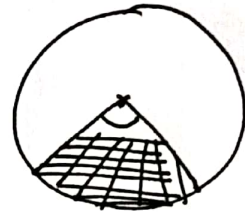
Class: IX. MATHEMATICS

3. AREAS RELATED TO CIRCLES

TEACHING TASK (JEE MAINS)

01. $\theta = 60^\circ$, $r = 7\text{cm}$

$$\begin{aligned}\text{Area of minor sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{60}{360} \times \frac{22}{7} \times 7 \times 7 \\ &= 25.67 \text{ cm}^2\end{aligned}$$



Ans: D

02. Conceptual

Ans: D

03. Given $L = 10\sqrt{3}$, $r = 10$

We know, $L = 2r \sin\left(\frac{\theta}{2}\right)$

$$\Rightarrow 10\sqrt{3} = 2(10) \sin\left(\frac{\theta}{2}\right)$$

$$\Rightarrow \sin \frac{\theta}{2} = \frac{\sqrt{3}}{2}$$

$$\Rightarrow \frac{\theta}{2} = 60^\circ \Rightarrow \theta = 120^\circ$$



$$A_{\text{segment}} = A_{\text{sector}} - A_{\text{triangle}}$$

$$= \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} r^2 \sin \theta$$

$$= \frac{120}{360} \times 3.14 \times 10^2 - \frac{1}{2} \cdot 10^2 \cdot \sin 120^\circ$$

$$= 61.37 \text{ mm}^2$$

Ans: B

04. Area of Major Sector = Area of Circle - Area of minor sector

$$= \pi r^2 - 15.7$$

$$= 3.14 \times 5^2 - 15.7$$

$$= 62.8 \text{ cm}^2$$

Ans: A

05. Conceptual

Ans: B

06. Area of major sector = $\frac{\theta}{360^\circ} \times \pi r^2$

$$= \frac{200^\circ}{360^\circ} \times 3.14 \times 15^2$$

$$= 392.7 \text{ cm}^2$$

Ans: C

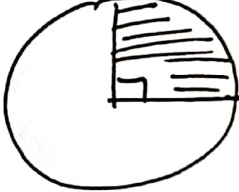
07. Area of minor segment

$$= \frac{1}{4} \times \text{Area of circle}$$

$$= \frac{1}{4} \times \pi r^2 = \frac{1}{4} \times 3.14 \times 8 \times 8$$

$$= 50.24 \text{ cm}^2$$

Ans: A



08. Conceptual

Ans: B

09. $\frac{\text{Area of minor sector}}{\text{Area of major sector}} = \frac{\text{Angle of minor sector}}{\text{Angle of major sector}}$

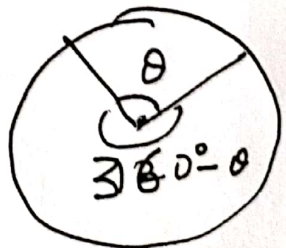
$$\frac{\frac{\theta}{360^\circ} \times \pi r^2}{\frac{360^\circ - \theta}{360^\circ} \times \pi r^2} = \frac{\theta}{360^\circ - \theta}$$

$$= \frac{1}{3}$$

$$\Rightarrow 3\theta = 360^\circ - \theta$$

$$\Rightarrow \theta = 90^\circ$$

Ans: A



10.

(3)

Area of required region

$$\begin{aligned}
 &= \frac{\theta}{360} \times \pi R^2 - \frac{\theta}{360} \times \pi r^2 \\
 &= \frac{60^\circ}{360} \times \frac{22}{7} \times 14^2 - \frac{60^\circ}{360} \times \frac{22}{7} \times 7^2 \\
 &= 77 \text{ cm}^2
 \end{aligned}$$

Ans: A

JEE ADVANCED

01. Conceptual

Ans: A, B, C, D

02 $\theta = 45^\circ$, $r = 14$

Area of minor sector

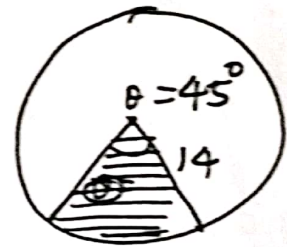
$$= \frac{\theta}{360} \times \pi r^2$$

$$= \frac{45^\circ}{360} \times \frac{22}{7} \times 14^2$$

$$= \frac{1}{8} \times \frac{22}{7} \times 14 \times 14 = \frac{1}{8} \times \frac{22}{7} \times 28 \checkmark$$

$$= 7 \checkmark$$

Ans: B, C

03 Statement I: $r = 6 \text{ cm}$, $\theta = 60^\circ$

$$\text{Area of Sector} = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{60^\circ}{360} \times \frac{22}{7} \times 6^2$$

$$= 18.86 \text{ cm}^2 \text{ (True)}$$

Statement II: Conceptual (True)

Ans: A

04. Statement I: Conceptual (True)Statement II: Conceptual (True)

Ans: A

05. Assertion: Conceptual (True)

(4)

Reason: Conceptual (False)

Ans: C

06. Assertion: Conceptual (False)

Reason: Conceptual (True)

Ans: D

07. $r = 35 \text{ m}, \theta = 120^\circ$

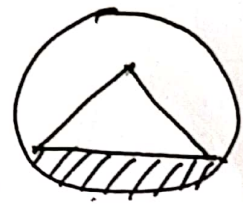
$$\text{Area} = \frac{120}{360} \times \frac{22}{7} \times 35^2 = 1283.13 \text{ (A)}$$

Ans: A

08

Area of the segment

= Area of the sector - Area of the triangle



$$= 1283.13 - \frac{1}{2} r^2 \sin \theta$$

$$= 1283.13 - \frac{1}{2} \times 35^2 \times \sin 120^\circ$$

$$= 1283.13 - ~~1260.85~~ 530.44$$

$$= 752.69$$

Ans: B

09. In a clock, 60 minutes $\rightarrow 360^\circ$

$\Rightarrow 1 \text{ minutes} \rightarrow 6^\circ$

$\Rightarrow 10 \text{ minutes} \rightarrow 60^\circ$

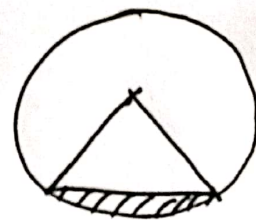
$$\therefore \theta = 60^\circ, r = 7 \text{ cm}$$

$$\text{Area} = \frac{60}{360} \times \frac{22}{7} \times 7^2$$

$$= 25.66 \text{ cm}^2$$

Ans: A

10. Area of minor segment
 $= \text{Area of the sector} - \text{Area of triangle}$



(5)

$$= 25.66 - \frac{1}{2} \cdot 8^2 \sin \theta$$

$$= 25.66 - \frac{1}{2} \cdot 7^2 \times \sin 60^\circ$$

$$= 25.66 - 21.25$$

$$= 4.41$$

$$\begin{array}{r} 25.66 \\ - 21.25 \\ \hline 4.41 \end{array}$$

Ans: C

11. Given $r = 8\text{cm}$, $\theta = 60^\circ$

$$\text{The area of segment} = \frac{\theta}{360^\circ} \pi r^2 - \frac{1}{2} r^2 \sin \theta$$

$$= \frac{60^\circ}{360^\circ} \times \pi \times 8^2 - \frac{1}{2} \cdot 8^2 \cdot \sin 60^\circ$$

$$= \frac{1}{6} \times 64 \pi - 32 \cdot \frac{\sqrt{3}}{2}$$

$$= \frac{32\pi}{3} - 16\sqrt{3}$$

$$= \frac{4}{3} (8\pi - 12\sqrt{3})$$

$$= \frac{4}{3} (8\pi - 12\sqrt{3})$$

$$\therefore a = 4, b = 12 \Rightarrow a + b = 4 + 12 = 16 \text{ Ans. 16}$$

12. $\frac{\text{Minor Sector}}{\text{Major Sector}} = \frac{5}{1}$

$$\Rightarrow \frac{360^\circ - \theta}{\theta} = \frac{5}{1}$$

$$\Rightarrow 5\theta = 360^\circ - \theta$$

$$\Rightarrow 6\theta = 360^\circ$$

$$\Rightarrow \theta = 60^\circ$$

Ans: 60°

13

⑥

$$a) \frac{\pi r_1^2}{\pi r_2^2} = \frac{9}{4} \Rightarrow \frac{r_1}{r_2} = \frac{3}{2}$$

$$\text{Circumference } \frac{2\pi r_1}{2\pi r_2} = \frac{r_1}{r_2} = \frac{3}{2} \quad (P)$$

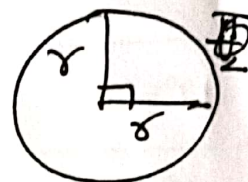
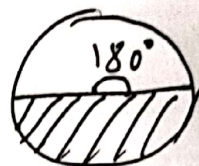
$$b) \pi r^2 = 2\pi r$$

$$\Rightarrow r^2 = 2r$$

$$\Rightarrow r = 2 \quad (r)$$

$$c) \text{Area of sector} = \frac{1}{2} \times \text{Area of circle}$$

$$\therefore \theta = 180^\circ \quad (s)$$



$$d) \text{Perimeter of the quadrant} \Rightarrow$$

$$= r + r + \frac{2\pi r}{4}$$

$$= 2r + \frac{\pi r}{2}$$

$$\text{Area of quadrant} = \frac{\pi r^2}{4}$$

$$\text{clearly } 2r + \frac{\pi r}{2} > \frac{\pi r^2}{4} \quad (\text{Check put } r=1)$$

$\therefore$ The given statement is true ()

Ans: P, R, S, -

14

$$a) \text{minor sector area} = \frac{60^\circ}{360^\circ} \times 3.14 \times 10^2 = 52.33 \quad (P)$$

$$b) \text{major sector area} = \frac{300^\circ}{360^\circ} \times 3.14 \times 10^2 = 261.67 \quad (Q)$$

$$c) \text{minor segment area} = 52.33 - \frac{1}{2} \cdot 10^2 \times \frac{\sqrt{3}}{2}$$

$$= 26.17 \Rightarrow 9.08 \quad (r)$$

$$d) \text{major segment area} = \text{Area of the circle} - 9.08$$

$$= 304.92 \quad (s) \quad \text{Ans P, Q, R, S}$$

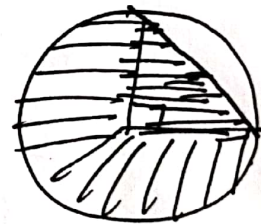
LEARNERS TASK (CUD'S) ⑨

01.	Conceptual	Ans: B
02.	Conceptual	Ans: A
03.	Conceptual	Ans: B
04.	Conceptual	Ans: A
05.	Conceptual	Ans: C
06.	Conceptual	Ans: C
07.	Conceptual	Ans: B
08.	Conceptual	Ans: C
09.	Conceptual	Ans: B
10.	Conceptual	Ans: D

ICE MAINS LEVEL

01. Area of major segment

= Area of circle - Area of minor segment



$$= 3.14 \times (10)^2 - \left[\frac{90}{360} \times 3.14 \times 10^2 - \frac{1}{2} \cdot 10^2 \cdot \sin 90^\circ \right]$$

$$= 314 - \left[\frac{314}{4} - 50 \right]$$

$$= 285.5 \text{ cm}^2$$

Ans: C

02 Conceptual

Ans: A (8)

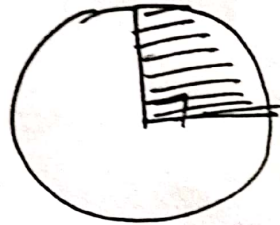
03

$$\text{Area} = \frac{40^\circ}{360^\circ} \times 3.14 \times 12^2$$

$$= 113.04 \text{ cm}^2$$

Ans: B

04



Central Angle = 90°

Ans: D

05 Conceptual

Ans: A

06. Area of Segment = Area of Sector - Area of triangle

$$= \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} \cdot r \cdot r$$

$$= \frac{90}{360} \times 3.14 \times 5^2 - \frac{1}{2} \cdot 5 \cdot 5$$

$$= 19.625 - 12.5 = 7.125 \text{ unit}^2$$



Ans: A

07

$$\text{Area of Major sector} = 154 - 38.5$$

$$= 115.5 \text{ cm}^2$$

Ans: A

08 Conceptual

Ans: A

09. Area of the circle = $\pi r^2 = \frac{22}{7} \times 21 \times 21 = 1386$

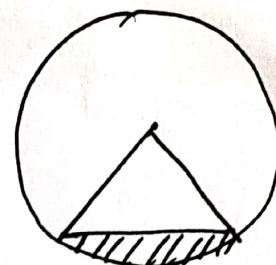
Area of Non-watered area = $1386 - 1155 = 231$

$$\text{Ratio} = \frac{1155}{231} = \frac{5}{1} = 5:1$$

Ans: A

10. Area of Minor Segment =

Area of minor sector - Area of triangle



$$24 = \frac{60}{360} \times \frac{22}{7} \times r^2 - \frac{1}{2} \cdot r^2 \cdot \sin 60^\circ = 16\sqrt{3}$$

$$\therefore \text{Area of triangle} = 16\sqrt{3}$$

$$\frac{1}{2} \cdot r^2 \cdot \sin 60^\circ = 16\sqrt{3}$$

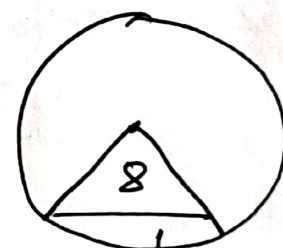
$$\Rightarrow \frac{1}{2} \cdot r^2 \cdot \frac{\sqrt{3}}{2} = 16\sqrt{3}$$

$$\Rightarrow r = 8 \text{ cm}$$

Ans: C

JEE ADVANCED LEVEL

01. A) Area of minor sector = $10 + 8$
 $= 18 \text{ cm}^2$



B) Area of Major Segment

$$= \text{Area of Circle} - \text{Area of minor sector}$$

$$= \pi \cdot r^2 - 10$$

$$= 36\pi - 10 \checkmark$$

C) Area of major sector = Area of circle - Area of minor sector

$$= \pi r^2 - 18$$

$$= 36\pi - 18 \checkmark$$

D) sector angle $\frac{\theta}{360} \times \pi \cdot 6^2 = 18 \checkmark$

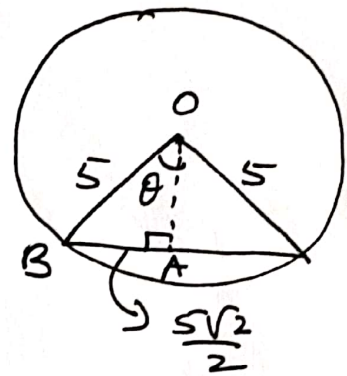
Ans: A, B, C, D

02 A) In $\triangle OAB$

$$\sin \theta = \frac{\left(\frac{5\sqrt{2}}{2}\right)}{5} = \frac{1}{\sqrt{2}}$$

$$\therefore \theta = 45^\circ$$

$$\therefore \text{Sector Angle} = 2 \times 45^\circ = 90^\circ \checkmark$$



$$\begin{aligned} \text{B) Area of minor sector} &= \frac{90}{360} \times 3.14 \times 5^2 \\ &= 19.625 \checkmark \end{aligned}$$

$$\begin{aligned} \text{C) Area of triangle} &= \frac{1}{2} \times b \times h \\ &= \frac{1}{2} \times 5 \times 5 = 12.5 \checkmark \end{aligned}$$

$$\begin{aligned} \text{D) Area of major segment} &= \text{Area of circle} - \\ &\quad \text{Area of minor segment} \\ &= 3.14 \times 5^2 - [19.625 - 12.5] \\ &= 71.375 \times \end{aligned}$$

Ans: A, B, C

03. Statement I: Conceptual (True)

Statement II: Conceptual (True)

Ans: A

04. Statement I: Conceptual (True)

Statement II: Conceptual (True)

Ans: A

05. Assertion A: Conceptual (True)

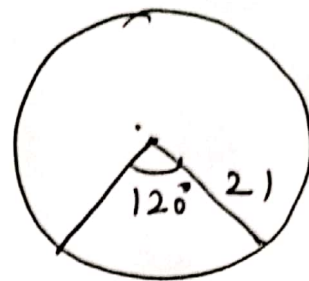
Reason: Conceptual (True)

Ans: A

06. Assertion:

06. Assertion:

$$\begin{aligned}\text{Area of minor Sector} &= \frac{120}{360} \times 3.14 \times 21^2 \\ &= 461.58 \text{ cm}^2 \text{ (True)}\end{aligned}$$



Reason: Conceptual (True)

Ans: B

07 central angle = $\theta = \frac{360^\circ}{8}$, $r = 15$

$$\begin{aligned}\text{Area of minor sector} &= \frac{\left(\frac{360^\circ}{8}\right)}{360^\circ} \times 3.1416 \times 15^2 \\ &= 88.35\end{aligned}$$

Ans: A

08 major sector = Area of the circle - Area of minor sector

$$\begin{aligned}&= 3.1416 \times 15^2 - 88.35 \\ &= 618.51\end{aligned}$$

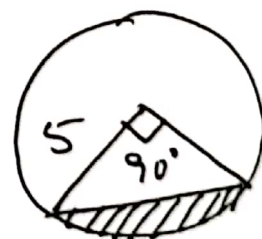
Ans: B

09. Area of minor Segment

= Area of minor Sector - Area of triangle

$$= \frac{90^\circ}{360^\circ} \times 3.14 \times 5^2 - \frac{1}{2} \cdot 5 \cdot 5$$

$$= 7.1429$$



Ans: A

10. Area of major segment = Area of circle - Area of minor segment

$$= 3.14 \times 5^2 - 7.1429 = 71.3571$$

Ans: B

11.

$$\text{Area of sector} = \frac{30^\circ}{360^\circ} \cdot \pi \cdot 6^2$$

$$= 6\pi = 12\pi$$

$$\Rightarrow K = 6$$

Ans: 6

12.

$$\text{Central Angle} = \frac{360^\circ}{6} = 60^\circ$$

$$\text{Area of the minor sector} = \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 14^2$$

$$= 102.66$$

Ans: 102

13

a) Conceptual (P)

c) Conceptual (S)

b) Conceptual (Q)

d) Conceptual (R)

Ans: P, Q, R, S

14.

a) Conceptual (P)

b) Conceptual (P)

c) Conceptual (S)

d) Conceptual (S)

Ans: P, Q, R, S

$$\Rightarrow \text{THE END} \Leftarrow$$